Journal of the Society of Arts.

*FRIDAY, NOVEMBER* 6, 1863.

## NOTICE TO MEMBERS.

The One-Hundred-and-Tenth Session of the Society will commence on Wednesday, the 18th November, at 8 o'clock, when William Hawes, Esq., F.G.S., Chairman of the Council, will deliver the Opening Address. The Chair will be taken at eight o'clock on the following Wednesday evenings:—

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| 1863. | November ......... | — | — | 18 | 25 | |
| „ | December ......... | 2 | 9 | 16 | — | — |
| 1864. | January ........... | — | — | 20 | 27 | |
| „ | February............ | 3 | 10 | 17 | 24 | |
| „ | March ............... | 2 | 9 | 16 | — | 30 |
| „ | April ............... | 6 | 13 | 20 | 27 | |
| „ | May.................. | 4 | 11 | 18 | 25 | |
| „ | June ............... | — | — | — | 29* | |

For the Meetings previous to Christmas the following arrangements have been made:—

November 18.—Opening Address by William Hawes, Esq., F.G.S., Chairman of the Council.

*** *On this evening the Prince Consort's Prize, awarded at the last Examination, and the Prizes awarded to the Artist-workmen who were successful competitors at the Wood-carving Exhibition held in June last, will be distributed.*

November 25.—"The Australian Colonies, their Condition, Resources, and Prospects." By Sir Charles Nicholson, Bart.

December 2.—"On Magneto-Electricity, and its Application to Lighthouse Purposes." By F. H. Holmes, Esq.

December 9.—"Recent Agricultural Progress and its Causes." By J. Chalmers Morton, Esq.

December 16.—"On the Economic Value of Foods, having special reference to the Dietary of the Labouring Classes." By Dr. Edward Smith, F.R.S.

The Council have made arrangements for the delivery of Courses of Lectures on the following subjects during the ensuing Session:—

Fine Arts Applied to Industry. By W. Burgess, Esq.
Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.
International Commerce. By G. W. Hastings, Esq., Barrister-at-Law.

These Lectures will be open to Members and their Friends on the same conditions as the Ordinary Meetings. Particulars of the Courses will be duly announced.

## COUNCIL.

The following Institution has been received into Union since the last announcement:—

Llanelly Mechanics' Institution.

* The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

## PREVENTION OF DECAY AND OXIDATION IN SHIPS.

As the prevention of decay in the timbers of wooden-built ships, and the fouling and oxidation of the plates of iron ships, have received considerable attention from the Admiralty and Merchant Shipowners, the following *resumé* of all the specifications at the Patent-office bearing on this subject is given:—

Dipping timber in boiled oil is a very ancient practice, and it would be difficult to trace its origin. In 1739, Alexander Emerton took out the first recorded patent for preserving wood from decay. He prepared the planks or boards with boiling oil in the then old way, and afterwards coated them with compounded poisons, powdered glass, and sand, cemented with painting colours and oils, laid on as paint. The next patent, which was for preserving copper, or plates of which copper is a basis, was granted in 1790 to Collins and Wyatt. They covered the plates with lead or tin. In the early part of the present century several chemists recommended decoctions, in the form of vegetable poisons, for saturating timber, and thus destroying all animal life in the green wood. None of these poisonous solutions seem to have succeeded, for, had they been found efficacious, their application would have been continued. There was then an interval, during which the stoppage of decay seems to have been abandoned, and dry rot allowed to take its course. In 1822, John Oxford secured a patent, whereby he undertook to prevent oxidation or decay in iron or wood, by preparing tar in such a manner as to stop the evaporation of the oil contained therein, saturating it also with chlorine gas. This purified oil is then mixed with 100 parts of white lead—or of the red oxide—25 parts of carbonate of lime, and 25 parts of purified coal tar added to the oil of tar. These ingredients are then applied as a paint. In the first days of iron in shipbuilding, rust was found to be a drawback to its general introduction. Scientific men saw the disadvantage, and sought to remedy the defect. Galvanic action, it was considered, would set all right, and the earliest patent in this direction was taken out by G. G. Bompass, in 1830. He sought to preserve metals from corrosion by an electric or galvanic process. For copper to be protected in sea-water he attaches an alloy of 9 to 10 parts of zinc with 100 parts of copper. In protecting iron he employed an alloy of tin, consisting of from 10 to 150 parts of tin combined with one of zinc. Following in the footsteps of Mr. Bompass, in the same year, Mr. John Revere patented an invention for fixing zinc protectors to the brace or stud of chain cables, and other iron surfaces exposed to the action of salt water. These galvanic zinc protectors were rivetted or soldered on according to requirement. It is known that one of the most distinguished of our electricians is in favour of inserting strips of zinc in the plates of ships; but if this principle proved correct in practice, it would long since have been universally adopted. Zinc plays an important part in patents for the prevention of oxidation. In 1837, Jacob Perkins got protection for a plan of coating copper tubes of boilers with a preparation consisting of two-thirds of zinc with one-third of copper; but he had been preceded in 1832 by Captain H. W. Craufurd, R.N., who proposed to preserve copper and iron from oxidation by coating with zinc paint in a fused state. Over this he laid a second covering of pure tin, or tin alloyed with lead. Captain Craufurd explains in detail his method of compounding the ingredients. In 1838, Le Comte de Fontainemoreau, considering Captain Craufurd's mode of fixing or adapting the zinc to this purpose as erroneous, applied for a patent of a more comprehensive description, for applying the zinc coating to metals. Again, in 1839, Mr. Thomas Dowling patented what he terms a conservative bath, applied to metals after grinding. He describes the machinery by which he effects this, the chief of which is a zinc wheel and galvanic vapour furnace.

In 1840, Mr. J. R. Neilson came forward with his invention for the application of a coating of copper, or copper

alloyed with zinc or tin, or both, to the surface of iron This was done by covering the mould to be cast with the material. In malleable iron, dried borax or flux is spread over the iron, which is then prepared with alloy heated to a temperature sufficient to melt copper, and, in its heated state, plunged into cold water to detach the scale of oxide. Mr. Arthur Wall, likewise in 1840, mixed 20 pounds of the strongest muriatic acid diluted with three gallons of water, then added 12 lbs. of steel or wrought-iron filings. The filings were heated to redness before mixture. The whole was then subjected to heating in a pan, &c., and the composition was then applied to prevent corrosion. In 1841, Mr. W. E. Newton employed silicates of potash, or soda, for making a plaster or coating to prevent iron from becoming rusty. After him came Professor R. Mallet, engineer, of Dublin, whose varied processes are of the most complex character. Finding that iron covered with zinc, when immersed in sea water, and certain fresh waters, gathered to itself a coating of carbonate of lime, destructive to the protective power of the zinc, and affording a surface for the attachment and growth of marine animals of the molluscous and testaceous classes, and aquatic plants, he applied chemical means to detach the scales of oxide from iron, and then plunged it into a preparing bath. After undergoing a series of processess, the metal is coated with an alloy or zoofagous paint, which paint is rendered poisonous by admixture of salts of metals, by means of which he sought to render the zinc effective as an anti-corrosive protector. In 1841, also, Mr. E. Morewood endeavoured to preserve iron from oxidation or rust by tinning it, and then dipping the tin covering or surface in molten zinc. Moses Poole, in 1845, claimed to possess an invention whereby he rendered iron more hard and durable, and free from oxidation, by the use of ferrocyanide of sodium, calcium, barium, or any other alkali, or alkaline earthy base ; to be used in a manner fully set forth in his specification. In 1846, Mr. Andrew Smith improved upon the plans for melting the zinc. He employed a bath of lead or tin, or any composition or medium that melts at a lower degree of heat than zinc, by which means the heat from the fire of the furnace is taken up and transmitted to the receptacle containing the zinc for melting. Baron Wetterstedt, in 1846, added the regulus of antimony to lead sheets, combined copper with antimony, made sheet metal by using lead and tin, and lastly, protected metals by paints thus prepared :—1st. One part of regulus of antimony to three parts of copper, mixed, melted together, run out into water, and then heated gently. Two parts of oxide of copper are added, and moistened with naphtha. The whole is then added to a composition of tar and naphtha. 2nd. Another paint is compounded of 30 lb. of tar, 30 lb. of pitch, 20 lb. of dried soot, 4 lb. of tallow from sperm oil, and naphtha added for consistency.

Mr. C. H. Paris, in 1849, coated metals with glass or vitreous matter. The metal went through a cleansing process. Gum water is then applied, and over this the dry or powdered glass is shaken, and then fused by heat till a glass surface is formed. Mr. Paris claimed the application of carbonate of soda for applying glass in this manner. Mr. J. Macintosh, in 1852, made a paint from decomposed india-rubber, in combination with oils or fatty matters, saponified by metallic salts, with lime for thickening the liquid. For bottoms of ships he recommends the india-rubber, when in a fluid state, to be combined with metallic soap, thickened with lime and coloured by pigments. Messrs. Hughes and Firmin, in 1852, manufactured lamp black from the vapour of coal tar, dead oil, dead oil salts, coal pitch, naphtha, linseed oil, and other materials. From the products a fuel is produced, and this residue has by another inventor been mixed with oils, ground, and made into a paint. In 1852, also, Mr. R. M. Glover took out a patent for a preparation of arsenite of lead and arsenite of copper, and the red and yellow sulphurets of arsenic. The proportion of each were as follows:—Two parts, by weight, of arsenite of lead, one of realgar, one of orpiment, and one of arsenite of copper. In the same year, Mr. J. Murdoch invented a variety of driers for zinc when the white of zinc is employed instead of white lead. The protoxides are manganese, cobalt, iron, tin, and nickel; for acids, the benzoic, urobenzoic, and the boric. In 1852, Mr. Binks patented a substitute for linseed or drying oils, in the products derived from dissolving what are called insoluble soaps. A pigment is then ground in this solution, and the paint is ready for application. The pigment may be white lead, oxide of zinc, lamp black, or any other. J. C. Medeiros, in 1853, proposed the use of mercury or quicksilver on iron plates for sheathing ships. The salts of mercury are dissolved, then a bath is formed, and the plates allowed to remain in the solution till their surface is equally and regularly amalgamated.

Mr. Newton, in 1854, made a paint from ground plumbago, pulverised charcoal, and the black soot formed by the burning of bituminous matter, along with ivory-black, or bone or lamp-black. Mr. Ryder also, in 1854, described a method for mixing gutta-percha with common resin, or tar, pitch, or asphaltum, dissolving them in impure benzole or coal naphtha. Mr. Newton took out a second patent, in 1854, for the production of a siccative black, brown, or grey pigment or colouring matter, by the admixture with the gas tar, or other organic substance to be carbonised for the purpose, of the oxides of potassium, sodium, calcium, aluminium, or other alkaline or earthy bases for paints. Mr. F. Ransome, in 1854, patented a mixture, consisting of ground oxides and carbonates of lead or zinc, and carbonate or sulphate of barytes with soluble silica. Mr. J. Rogers, in 1855, to prevent oxidation, deoxidizes metallic ores by a revolving cylinder, fitted with helical or screw-formed divisions to receive the ores in a pulverised state, and then submits the same to heat, and constant agitation by the revolution of the cylinder. Mr. B. Rosenburg, in 1855, manufactured a paint as follows:—100 lbs. of triturated white lead, 2½ gallons of copal varnish, 1⅛ gallon of spirits of turpentine, 1⅛ gallon of linseed oil, and, for colouring, a small quantity of red lead. Before the metal is painted it is subjected to the fire for cleansing, and when cool the preparation is applied, then varnished with copal, and dried by a hot air process. Mr. J. E. Cook, in 1855, proposed a composition consisting of gum shellac, dissolved in methylated spirit or in wood spirit. In 1856, the patent of Messrs. Bancroft and White claims the manufacture of oils from petroleum, for preserving metals and ships' sheathing. Mr. A. F. Mennons, in 1856, obtained a patent for a non-conducting and inoxidable composition for metals, made thus :—

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| Argillaceous clays, containing a certain proportion of alumina ... ... ... ... ... | 100 parts |
| Oily substances and residues ... ... ... | 6 ,, |
| Oil sediment ... ... ... ... ... ... ... | 5 ,, |
| Fat... ... ... ... ... ... ... ... ... ... | 2 ,, |
| Animal charcoal ... ... ... ... ... ... | 2 ,, |
| Mucilaginous substances, such as glue, &c. ... | 2 ,, |
| Wood sawdust, already employed in the purification of oils in the processes of dyeing ... ... ... ... ... ... ... ... | 10 ,, |
| Waste hair well beaten ... ... ... ... | 4 ,, |

To the preceding materials a decoction of logwood and soot is then added.

Mr. J. M'Innes, in 1856, was granted a patent for coating metals with powdered emery stone mixed with a varnish of shellac dissolved in spirits of wine, with the addition of castor-oil. As emery contains 87 per cent. of aluminium, Mr. M'Innes considered that this paint would be solid enough to resist all action in the water, and never decompose. Mr. R. D. Atkinson, of Hull, in 1856, invented a plan for coating and protecting metals from oxidation, by depositing copper or brass upon surfaces of prepared iron, the deposit to be melted in conjunction with carbonic acid gas, the coating to be put on by a brush, or through the medium of galvanism. Depositing brass on iron

is now being successfully carried out at Portsmouth, by Mr. Wielan, on armour plates and other iron surfaces. Mr. A. Reid, mineralogist, in 1856, describes in his specification what he deems a sure way of preventing oxidation. He places the iron in a properly constructed furnace, then covers the metal with soot, or other matters possessing the like element; the temperature is then raised to red or white heat, and continued for half an hour, or according to the size of the iron operated upon. It is then suffered to cool, the surface is cleaned, and Mr. Reid asserts that a coat impervious to rust is formed. If this is verified by positive experiments, the cheapness and simplicity of the plan deserve to be widely known. Mr. Joseph Poleux, of New York, communicates, in the same year, a plan to overcome oxidation. He employs muriatic acid, nitric, or sulphine acid, of the ordinary degrees of concentration in commerce, without dilution, combined with the introduction of spelter into the cleansing process. In 1857 Mr. G. Bedson patented a new process. He melts a quantity of pitch derived from mineral tar, and a proportion of tar oil, with caoutchouc tempered with tar oil and shell-lac, the substance to be solid and elastic when cold. Mr. C. F. L. Oudry claims depositing copper on a preservative or intermediate coating instead of on the metal. He deposits copper in a pure state to any thickness on all metals. Mr. C. Iles, in 1857, described a means of applying earthy cements to metals. In 1858, Mr. J. Coutts received a patent for applying the following pigment by heated air:—

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| Carbonate of baryta .. ... ... | ·650 |
| Litharge ... ... ... ... | ·065 |
| Arsenious acid ... ... ... ... | ·030 |
| Asphaltum ... ... ... ... | ·050 |
| Oxide of calcium ... ... ... | ·030 |
| Creosote (oil of tar) ... ... ... | ·175 |

Perhaps the most novel introduction is that patented here by Messrs. Bouchard and Clavel, the Paris bankers, in 1858. On the estate of La Gruerie, in Charney, Department of Yonne, France, is found an earth of the ochre description, called "Burgundy Red." This earth contains most valuable properties, and is said to be an exceedingly good preservative against rust. It is used as a cement and paint by admixture with the following:—

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|---|---|
| Burgundy red ... ... ... ... | 66 parts |
| Grease or oil ... ... ... ... | 15 ,, |
| Lime ... ... ... ... ... | 11 ,, |
| Unburnt earthenware, chalk, or Roman cement ... ... ... ... | 8 ,, |
| | 100 ,, |

This is said to prevent oxidation if the earth is merely diluted with volatile oil. D. M'Crae, in 1858, was allowed a patent for preserving bottoms of ships from fouling or decay. He applies grease from the cells of boiled bones, kitchen-stuff, and butter without salt; a poisonous matter is mixed with these fatty substances. Mr. G. P. Lock, in 1858, made a composition for the under coating of iron ships, made from iron ore ground in boiled linseed oil 50 per cent., oil of turpentine 50 per cent., well mixed. For the outer coatings, white lead 40 per cent., blue mineral or copperas 10 per cent., and oil of turpentine 50 per cent. In 1859, Mr. Henry, on the part of Moisant and Co., sought protection for bituminous products and compounds of bitumen for preventing oxidation. Mr. T. J. Laballe made a preparation of caoutchouc paints and colours for vulcanising. Mr. J. Crawford, of Liverpool, in 1859, applied for a patent for a metallic paint or varnish, composed of plumbago, or black lead, fine or gum varnish, arsenic, and spirits of turpentine mixed. Mr. F. W. Emerson, in 1859, prepared an anti-corrosive paint from oxi-chloride of lead, mixed and ground with oil, turpentine, varnish, or other vehicle. Mr. Weild, in 1859, sought to economise time and labour by a mechanical machine for applying paints to metals on large surfaces. Mr. James Meikle, in 1859, proposed coating iron ships with asphalte. In the same year, M. Auguste Pin dissolved sugar in muriate of zinc, then added wax and soap, in which was incorporated calcareous stones, phosphate of soda, sulphate of zinc, and copper, and the syrup of potatoes or sugar, with powdered marble, quartz, or felspar.

In 1859, Mr. F. G. Spilsbury, of Louvain, applied for a patent for the manufacture of a paint. He took sulphate of lead, and heated it to a red heat, either by itself or mixed with alumina or other earths; the pigment thus obtained to be washed first with sulphuric acid, then with water, when it is finally dried. Previous to drying the pigments they are digested with salts of tungstic acid, molybdic acid, titanic acid, tantalic acid, arsenic acid, acid of antimony, or other metallic acid, or with mixture of the above salts. A combination between the sulphate of lead and the metallic acid or acids is obtained, and the resulting pigments are dried in like manner after having been cleared from all adhering salts. The pigments may then be mixed with oil and used as a substitute for white lead. Mr. J. F. J. Lecocq, in 1860, prepared a calcareous varnish for coating iron and the bottoms of ships. Mr. H. Kemp, in 1860, patented a composition consisting of peat tar, wood tar, methylated spirit, peat oil, or linseed oil, arsenic resin, and carburet of iron, for preserving ships' bottoms. Mr. Allen's plan of making a coating or anti-corrosive paint for metals is thus given:—Ammoniacal liquid obtained from coal tar, or gas tar, prevents incrustation in boilers, and is applicable to painting the inside plates. Messrs. Pile and Smyth, of West Hartlepool, took out a patent in 1860. They employ a red composition and enamel, consisting of a combination of litharge, Venetian red, and pine varnish. Over this composition is applied a coating of resin, gums, or any pitch or bituminous substance, with the addition of coal tar, or oil. This is put on in a hot lava state, and the process is called enameling. An impermeable oil varnish was patented by M. Antoine Bonet in 1860, composed of 100 parts of alcohol, 100 parts of spirits of turpentine, one part of sulphuric ether, and one of carbonate of soda.

Mr. Robert Smith, shipowner, of Finsbury, applied to the Patent-office, in 1860, to protect his system for keeping vessels from fouling and worming. He applies equal parts of pitch, tar, resin, and turpentine, with any other adhesive compound. Assafœtida to be mixed with the foregoing, as a poison to destroy life. When the coating is laid on, and dry, the whole to be covered with paper or cloth. Mr. G. Hallett, in 1860, in his patent explains his method of protecting metal. He grinds the oxide of antimony to powder, then dries it, and mixes with it 12lbs. of linseed oil to the hundredweight of powdered oxide. Mr. Richardson, 1861, to prevent oxidation, would cover the metal with vulcanised india-rubber, cloth, or gutta-percha, the object sought being to provide for unequal expansion of the metal and coating. Mr. Francis Pulz, chemist, 1861, causes oxygen to be passed through sulphuric acid, to render the oxygen more active as an oxydising agent, as it combines, when so treated, with other substances for which it has an affinity, for manufacturing purposes. Mr. Pulz, also, in a second patent, submits oily matters to this oxidising agency, by causing the sulphurated gas to pass through them when in a liquid state. Mr. Martin Miller sends a communication, in 1861, for coating metals by metals or alloys in different ways. Mr. John Hay, in 1861, patented a drying oil. He lays a non-conducting coat, and then makes a paint by grinding in linseed oil the black or protoxide of copper, which is then boiled till reduced to the sub-oxide, and by thus oxygenating the oil he claims to have formed a quick drying cupreous oil. Mr. John Snider, of the United States, patented here a compound, in 1861, for coating metal. He reduces amorphous graphite to fine powder, and then mixes it with ore by the agency of a heated steam pipe. When cool and dry, one pound of oil is added to three pounds of the powder, and when the ingredients are combined, hot pure beeswax, in the proportion of one pound

of wax to 10 lbs. of graphite, is mixed. Afterwards linseed oil may be added. Mr. Snider details his manner of manipulating and preparing the graphite and ore. Messrs. Hallett and Stenhouse, in 1861, obtained a patent for the manufacture of pigments for coating surfaces. They employ native oxide of antimony, chemically treated in ways too intricate for explanation in this abbreviated outline, and mixed with red lead or litharge. They sometimes take type metal or worn-out types, reduce them to a coarse powder, and then mix them with their own weight of zinc, and calcine them. This produces a yellow pigment.

## ON AILANTHINE.

The following paper, by Dr. ROBERT PATERSON (Corresponding Member), was read before the Botanical Society of Canada:—

There are few individuals who have not watched the interesting changes which take place in the larvæ of the *Bombyx Mori*, or common silk-worm, from the point of its exit from the egg until it has reached its full butterfly existence; and many there are who have been sadly disappointed at the mortality which comes over a brood of silk-worms in a single night from some cause or causes unknown, and consequently unremediable. Such epidemics are continually occurring in China as well as Europe, and constitute one of the greatest obstacles to the introduction of the culture of the silk worm into England. What occasions this sudden decimation of these insects has never been determined, but has long led to a wish, on the part of those interested, that a more hardy breed of silk-producing worms could be introduced into Europe, even though the produce was coarser, and of a worse colour, than the ordinary mulberry silk.

Recent information, through our missionaries in China, leads us to the knowledge that there is a considerable number of worms used by the Chinese, in different districts, for the production of various qualities and coarseness. These varieties of silk are used in China principally for the manufacture of dresses for the peasantry. Of late, however, some of these have reached this country, and have been considered durable and excellent. Could we but rear such silk in our country, as we hope shortly to be able to show that we can do, how much of the present overwhelming distress, which is visiting our manufacturing districts in consequence of the American war, might be avoided? Such material, if not used alone, might be mixed with cotton or wool; and thus many new and beautiful, if not durable, fabrics might be produced.

In 1814 Dr. Roxburgh* published an interesting memoir on the silk-producing moth of the East Indies, and soon afterwards the Arrindy or Palma Christi silk-worm was introduced into Europe. The castor-oil plant, in this climate and in the north of France, is but a delicate shrub; in the south of Europe, however, where the temperature never reaches the freezing point, it becomes a tree of very striking aspect, with large and rich tinted foliage. In such districts, therefore, the Arrindy moth thrives well, having plenty of food, undergoing its changes rapidly, and yielding five or six crops annually of silk of excellent quality. What was required for our climate, however, was an insect which, while sufficiently hardy to stand our cold springs and autumns, would also be regardless of storms, rain, dew, &c. Such a worm was first sent to Europe by the Abbé Fantoni, a Piedmontese missionary in the province of Shan Tung. He sent some cocoons, immediately after the first gathering in 1856, to some friends in Turin. The name of the tree on the leaves of which they lived was to him a mystery, but he described it as being like the leaf of an Acacia: so when the young brood hatched, various and many were the plants tried for their food, until the leaves of the *Ailanthus glandulosa* were presented to them; these they immediately ate greedily, and always preferred them afterwards to any other kind of food.

* Linnæan Transactions, Vol. 7.

There can now be little doubt but that the Arrindy or Palma Christi moth introduced into Europe from Dinajepore and Rungpore in Bengal in 1854, and the Ailanthus moth introduced into Europe from the province of Shan Tung in China, in 1858, are one and the same animal. The insects introduced in 1854 were delicate, and did not stand much lowering of the temperature; besides, the tree on which they fed perishes at 32° or 33° Fah. The insects introduced in 1858 were hardy, stood rain and cold, and the tree which they preferred is a hardy one in our climate. Those introduced in 1858, from China, would not eat the Palma Christi, and very naturally it was believed that they were different insects; upon examination, however, they turned out to be the same. Their changes, the colour of their larva, the character of the cocoon, the kind of silk, and the characterising marks of the moth itself pronounce them at once to be the same animal. But how have these animals acquired such different habits of taste? This can only be explained on the supposition that a long period of hardening in a temperate climate, like the province of Shan Tung, would produce in course of time a more hardy progeny, feeding habitually on a common plant of the country, while the more effeminate brood of Central India preferred as food the leaves of a plant which will only flourish in warm latitudes. Unless specific distinctions exist, it is clearly a bad plan to distinguish an insect from the peculiar plant it eats, for this may be a simple point of preference—if it cannot get the one it will eat the other, and thrive on it; besides, a long period of hardening will often enable an animal to live and thrive on a vegetable very different from its native food. We need only instance the ordinary *Bombyx Mori*, or common silk-worm, the finest varieties of which, after passing a year or two in our climate, will live and thrive, and spin beautiful silk on the common lettuce. Of the tree on which the ailanthus worm feeds, it may be necessary here to speak shortly; we shall have to describe the animal itself more fully afterwards.

It appears that the tree was originally introduced into this country by the Abbé d'Incarville, in 1751, as the "Vernis de Japon" tree, or that which yielded the famous Japan or China varnish. This turned out, however, to be a mistake, as the true Japan varnish tree has since been introduced into Europe. Since this latter introduction, the *Ailanthus glandulosa* has been known as the false varnish tree. It is a hardy plant in our climate, standing severe winters well, and producing an abundant crop of leaves, especially from young shoots, in early summer. It has no especial partiality for particular varieties of soil, thriving as well, and producing as abundant a crop of leaves, in the most barren soil as in the richest loam. It seems equally indifferent, too, as to the characteristics of the atmosphere in which it lives, healthy young trees being observable in the squares and smoky environs of London. The advantages of a plant such as this in the rearing of a hardy animal on its foliage need not be pointed out. Throughout France, generally, this tree flowers and seeds freely, and the seed sprouts and grows readily in Great Britain; but in addition to this method of propagation, another exists in the roots, which, if cut into pieces like the potato, spring forth and grow luxuriantly; no plant, indeed, can be more easily raised, or more easily increased when grown, than the *Ailanthus glandulosa*. But to enable this plant when grown to yield a proper supply of food for the ailanthus worm, it is necessary to cut it down and grow it ozier-like. In this way young shoots spring forth abundantly, and bear large and delicate leaves fitted for the young worm, and greedily devoured by the older ones. They have an additional advantage also that when the insects are placed upon them in the open air they are more easily protected by nets, &c., from the depredations of birds, insects, &c.

So much for the plant on which the animal feeds. Let us now turn to the insect itself:—I have already stated

that the ailanthus silk-worm was introduced into Europe in 1856. Its cultivators have not been idle since that time, as we find that M. Guérin Méneville endeavoured to introduce this worm into France. His first experiment did not succeed, but the following year he reared a satisfactory crop of cocoons in the open air; this, however, and all the efforts of the Société d'Acclimatation of Paris were not sufficient to effect the general introduction of the animal into France. It became necessary for him to show that agriculturists might derive a profit, and a good one, from the rearing of this insect.

Energetic, and thoroughly convinced of the success of such an experiment on a large scale, he induced personal friends to experiment on a larger scale at Toulon, in Provence, and at Chinon (Indre-et-Loire), the one being nearly in the south, the other in the centre of France.

At Chinon, for instance, 4,500 worms were placed upon flourishing thickets of ailanthus, which had been cut down and grown as bushes with that intention. Their development progressed satisfactorily, and they yielded 3,515 excellent cocoons, after suffering without injury, rains, heavy storms, and the attacks of birds and insects. The result of the experiment was a loss of about a fourth part, while the average loss of mulberry silk-worms is about one-half.

M. Méneville, after some careful experiments and calculations, which were submitted to the imperial government, has thus stated his profit and loss account, on the rearing of ailanthine, or the silk of this worm, produced in districts south of Paris.

| | Francs |
|---|---|
| Twelve acres of ailanthus copse, share of expense of planting and annual expense of keeping up . | 2,030 |
| Average of receipts from two crops of ailanthine . | 9,945 |

which leaves a balance of 7,915 francs for the twelve acres, or in round English numbers, £330 for twelve acres, or £27 10s. per acre. In India and China there are said to be six crops of silk annually; in the south of France two or three crops, but in the north of France and Great Britain two at most, and more securely one crop might be relied on. Let us take one good crop, and see how our profit and loss account would stand in Great Britain. The half of £27 10s. or £13 15s. would be the result, or about it; and be it remembered, for land, that after the planting of the *ailanthus* it requires no manure or tillage whatever, and the kind of soil being that on which nothing else would grow, provided always that it has as sheltered and sunny an exposure as possible. It always occurred to me that the climate of Canada would be especially favourable for the growth of ailanthine. The insect and the plant on which it feeds will stand any amount of cold; and when the Canadian summer arrives, rapid growth would take place in the tree, followed by hatching of the worm; in this way food would be speedily produced for the young brood, and two, if not three, crops of silk taken from the trees during the season. The experiment is one worthy of trial.

In England and Scotland, for the last two years, some experimenters have been at work, but as yet without any quantitative result. In the spring of 1862 I received, through the kindness of a friend, fifty eggs of the *Bombyx Cynthia;* they hatched in about ten days after their arrival; they were fed with cut branches of *ailanthus;* kept in the ordinary temperature of the atmosphere, but under glass. From the fifty worms (for the eggs all hatched) with all my inexperience, I had thirty-five large and fine cocoons, being a result not far short of that in the central districts of France. With more experience, and with growing plants prepared for the trial, I do not fear for the result of a quantitative trial in Scotland at any future year.

It is my intention, in describing this insect, to follow the different changes which it undergoes from the egg onwards until we arrive at the characteristic moth itself, from which distinctive marks and peculiarities are chiefly taken.

THE EGGS.—These are about the size of a large pin head, twice as large as those of the mulberry silk-worm, with which we are all familiar. They are yellow coloured, equally large at both ends, flattened from above downwards, and with a depression in their centre. They soon change their colour to a greenish black, the colour becoming more marked the nearer the point of hatching is at hand. The caterpillars are hatched from ten to fifteen days after the eggs are laid, according to temperature.

THE CATERPILLAR.—When the worm first escapes from the egg it is exceedingly minute; the colour of the segments of its body at this early stage is obviously yellow, but there are so great a number of black spots and dark coloured tubercles over it, as to give the impression that it is of a black colour; during the second period, that is to say after the first change of skin, the yellow colour becomes more marked, but the spots and tubercles are still black. During the third period they become nearly pure white, arising from the presence of a white mealy secretion over their bodies, destined, obviously, to protect them from rain or dew, as water will not fix on it; the spots and points of the tubercles are still black or bluish black.

During the fourth period the body is at first white, but gradually changes to a pale green, the tubercles assuming the same colour, and soon the head, the feet, and the last segment become of a golden yellow; the flowery secretion still, to a certain extent, exists, and there are always black points upon the segments or rings of the body.

During the fifth period the emerald green colouring becomes more intense, the points, as to segments, assume a soft black colour, and the extremities of the tubercles a marine blue. The caterpillar grows rapidly during this stage, eats largely and greedily till it attains the length of from $2\frac{3}{4}$ to 3 inches long, it then ceases to eat, becomes torpid for a few days, and, after fastening a few leaves together at the extremity of a leaf or branch, it begins its cocoon. Such is the general character of the changes which this caterpillar undergoes; but to enable those who may follow out this inquiry to know when these changes may be expected and the size of the animals in them, I will give a short table of my own experience, and that of my friend Dr. Gudwad, both in Scotland :—

| | | |
|---|---|---|
| Eggs hatched, 28 to 30th June ...... | size | $\frac{3}{8}$ of an inch. |
| First change, 7 to 9th July............ | ,, | $\frac{1}{2}$ ,, |
| Second change, 13 to 15th July...... | ,, | 1 ,, |
| Third change, 20 to 22nd July ...... | ,, | $1\frac{1}{4}$ ,, |
| Fourth change, 28 to 30th July...... | ,, | $1\frac{1}{2}$ to 2 inches. |

From this time till the period when it begins to spin it rapidly grows till it reaches from two and a half to three inches long, depending upon the abundance and quality of its food.

The experience of my friend Dr. Gudwad is as follows:—Eggs hatched 19th September; 28th September first change began; 5th October second change began; 12th October third change began; 21st October fourth change began; 3rd November began cocoon. The temperature ranged from 47° to 55°.

THE COCOON.—I have already remarked that after a short period of torpidity when no more food is taken, and during which the remains of the undigested food are passed by the worm in abundance, it begins its cocoon by fastening some threads of silk to the end of the branch or leaf stalk, and, after binding some leaflets together, it spins its cocoon in the hollow thus formed. The colour of the silk is of a yellowish-brown very like, indeed, to that of a decayed leaf. In weaving its cocoon the worm leaves at its lower extremity an elastic opening for the exit of the moth. The threads at this opening are not cut across, but simply turned and laid one over another. The silk of this worm has not as yet been unwound in a continuous thread; this, doubtless, arises from the substance which glues the threads together, requiring some other solvent

than the warm water which so readily effects the solution of the gummy secretion of the mulberry silk. This, however, cannot long remain undiscovered in this country, as a chemical solvent for this secretion will doubtless ere long be found.* In China even there is reason to believe that this has been accomplished, as the last examples of *ailanthine* from that country are stated to leave no doubt of their having been unwound from the cocoon. Even the carded silk of this worm is abundantly used. In China it forms the most durable dresses of the peasantry, dresses which are often handed down from father to son. In France this "flosille" or floss silk is abundantly used for weaving with thread and wool and in the manufacture of fancy stuffs. At Roubaix, Nismes, and Lyons, it is imported from abroad in large quantities to the extent of 1,290,000 kilogrammes annually.

Mons. Geoffrey St. Hilaire, President of the Société d'Acclimatation of Paris says:—"Here is the report of the weavers at Alsace, who have made use of ailanthus silk. M. Schlumberger has found the cocoon very easy to card and spin; the thread obtained is less brilliant, strong and rough; it left no residue, not more than in combing the thread. It is a most excellent stuff for use in all manufacture where *burre* is employed. The cocoons are easily cleaned, and they will take a good dye. This culture, made on a great scale, will furnish in abundance a finer and stronger floss than the mulberry silk-worm. The worm remains in the cocoon in the chrysalis condition for from twenty-six to thirty days, at which time the moth makes its appearance, coming quickly and easily through the valvular opening at the extremity of the cocoon. At this time its wings are moist, soft, and folded up; and, naturally, upon emerging from the cocoon, it seizes hold of the lower part of it, thus allowing its large wings to drop, become unfolded, and stiffen. If this precaution is not taken when the moths are allowed to exit artificially, their wings never expand, but remain crumpled up, the moth never regaining much activity with its wings in this state, and seldom connecting itself with the opposite sex. In rearing these moths, therefore, it is of consequence to observe that upon thêir exit from the cocoon they have some substance on which they can climb up and allow their wings to hang down and become expanded.

The moth has been long familiar to us, in collections of Chinese butterflies, brought to this country. It is large, the expansion of its wings being about five inches; the head and antennæ are greyish brown, the latter strongly pectinated; thorax and abdomen lighter grey; wings, with a broad transverse light-coloured band near the middle, the space within which (forming nearly an equilateral triangle) is brownish grey, and that without ash colour, running into brownish grey at the margins of the wings. Just within the margins there are two narrow brown streaks running parallel with them, somewhat interrupted before reaching a black spot near the apex of the superior wings; this spot is surmounted by a white crescent, and a zigzag white line runs from it to the tip. The basal portion of the superior wings is traversed by an ash-coloured bar commencing on the posterior edges next the shoulder, and after continuing in nearly a straight line for about half an inch is suddenly deflected and terminates on the anterior margin, between this bar and the transverse scapula line there is a pale longitudinal spot surrounded with black. The under wings likewise bear a similar spot but more crescent-shaped, and towards their base there is an ash-coloured arched bar bounded on the outer side with black. The under side differs principally in being paler and destitute of the angular and arched bars at the base of the upper and lower wings.† These moths, when in health and especially in sunshine, connect themselves and lay eggs in a few days. If they do not develope their wings, or the temperature is low and without sunshine, the males do not seek after the females, hence the eggs laid are often, under these circumstances, unproductive.

* It has been stated by some that the cause of the silk not winding off results from the slanting opening at the bottom of the cocoon, admitting water, and thus sinking it and breaking the thread. This explanation is not satisfactory and is inconsistent with fact.

† Sir H. Jardine's description of *Saturnia Cynthia*, and corresponding in every particular to *ailanthus* silk moth.

## CITY OF LONDON COLLEGE.

The annual distribution of prizes and certificates gained at the Society of Arts Examination, 1863, and also the City of London College prizes and certificates, took place on Thursday evening, 29th ult., in the lecture-room of the College, Leadenhall-street. The Lord Mayor presided.

The Secretary read the report, from which it appeared that marked success had characterised their efforts for the educational benefit of the young men of the metropolis. The average number of students during the Michaelmas and Easter terms exceeded 800. The students of the college who had presented themselves at the annual examination held by the Society of Arts had more than maintained its former reputation. They gained no less than 10 prizes out of 50 awarded by the Society. One of their students, Mr. William Vaughan (recently elected a professor), had this year obtained the Prince Consort's prize of 25 guineas. Upon the subject of finance, the council regretted to have to record a deficit of about £154 13s. 2½d. on this year's working, which, added to the deficit of £52 15s. 7d. in last year's account, makes a total deficit of £207 8s. 9½d. This had arisen from the great expense of working an Institution mainly dependent upon the small fees which the students pay, and from the loss of sub-lettings, through the increase in the number of classes and consequent additional demand for class accommodation. The Council had been reluctantly compelled to re-arrange the scale of class fees, with the view of making all the classes more nearly supporting. The Council earnestly desire to remind their friends and the public generally that the sum of £700 must yet be raised before the amount specified as required for the permanent establishment of the College is completed; until this sum is raised the Institution is always liable to report a painful deficiency in its funds, and the usefulness of the College will, by consequence, be much impeded.

The Bishop of London, after a few introductory remarks, said he was quite sure that all present, and, in fact, all in the country, would feel the great loss they had sustained by the death of Mr. Cubitt, which had occurred that day. His lordship eulogised his great personal and public qualities both as a private and public man. His loss to the College was the more to be deplored, seeing that the interest he took in it contributed in a very large measure to the success which it had obtained. The old times when the apprentices of London lived in their masters' houses, had passed away, and the young men now lived by themselves. To meet this change great efforts had been made, and in aid of these efforts that Institution, the City of London College, was established, to protect them against temptation, and provide for them innocent and instructive occupation during their evenings. Viewed in this aspect, the real good done by the Institution during the last two years was very great indeed. But they were engaged in doing something more than this. The Institution held out to young men a motive that by making good use of their time they could do much to secure their rise in life, for in this free country the road open to eminence was one of honesty and perseverance. Other means, of a discreditable nature, might raise men in life in tyrannical countries, but that was not the case with free Englishmen. Thousands of examples were around them of young men who had raised themselves by their honesty and perseverance, and more especially in that city. Every profession, even the aristocratic professions, abounded with such examples. Still men might deserve to rise without being able to rise; but it

was in every young man's power to attain such a degree of improvement as to deserve to rise; and the very possession of these capabilities was in itself an incalculable good. They could all make use of the opportunities which God afforded them. But after all, these were but secondary motives for young men joining that Institution. The chief motive for doing so ought to be a desire to cultivate what God had committed to their trust, to improve the gifts of God, and enable themselves to perform well their part in life. If a man was to perform the duties which God had laid upon him, he must cultivate his intellect; such was the inevitable condition of all success in the age in which they lived. And to those who had to struggle with life, and who might think the pursuit of intellectual culture difficult under the circumstances, he would say that young men born and brought up under easy circumstances had far greater difficulties to contend with, as every one who had any knowledge of education was aware. Young men who had everything to do for themselves could acquire knowledge with less difficulty than those who had everything done for them; and difficulty itself in the acquisition of knowledge spurred on those in search of it to overcome the difficulty. There was no solid acquisition without effort; and as an example of efforts successfully made in this direction, they could not have one more forcible or more illustrious than that of the late Prince Consort. They knew that the education that a man gave to himself was always the best, and that was the sort of education the young men were seeking in that Institution—education only to be got by the hard work of their own minds. The study of languages, as pursued within those walls, was no part of the process of training the mind, but rather the acquisition of an instrument which would be of use in the business of life; but such of them as could give the time and attention necessary to mathematical subjects would find this study a real training of the mind. That College had a great advantage over others—it was self-governing; the young men themselves were part of the governing body, and nothing was more likely to conduce to the stability and usefulness of the Institution. It was that system of self-government which had secured permanent life to all the institutions of the country, and he hoped that principle would be always adhered to in this College, as well as in the great seats of academical learning of England. The library and the classes offered advantages which no doubt they would avail themselves of, but let them not hope to make much progress by listening to lectures. The classes, however, were what they must look to—the classes were the most valuable part of the Institution, the only real means of intellectual culture, and the only test of progress. Examinations also were of great use; everybody now had to pass examinations. The Lord Mayor and himself (the Bishop) were, he believed, the only two persons who now could attain their present positions without being competitively examined. As to religious instruction, with respect to which he had a privilege to speak, he did not know well what that instruction meant if it was not to enable men to live better in the eyes of God and of man. He knew no other test of religious instruction than that which was derived from the Christian life of a man. He hoped the young men educated in this College would so profit by the instruction afforded, secular as well as religious, as to be always on the right side in the conflict between a pure Christian life and vice; and that they would always be able to see God in His works.

The right rev. prelate then distributed the prizes gained at the Society of Arts examination, of which a list has already appeared in the *Journal*, and the College Prizes, as follows:—Scholarship: Hugh Lloyd Hughes. Associates: James Lewis Herman Hempleman, Hugh Lloyd Hughes, and James Rigby Smith. T. Prince, the Greatorex prize; A. C. Maybury and A. Day, the Louth prize; J. R. Smith, the Essay; G. J. Stancliff, arithmetic; A. Day, book-keeping; A. C. Maybury, chemistry; F. S. Donaldson, divinity; H. L. Hughes, first French; H. Brain, second French; T. Prince, German; A. C. Maybury, Latin; W. Price, Spanish. Also numerous certificates.

The following resolution was proposed by the Rev. C. Mackenzie, and seconded by Mr. Alderman Finnis:—"That this meeting, representing the friends and supporters of the City of London College, desires to tender its best thanks to the Society of Arts for the liberal encouragement received at their hands, as manifested by the prizes and certificates this day distributed."

Mr. WINKWORTH, a Vice-president of the Society, said that in the absence of their chairman, Mr. Hawes, who had been called from London on special business, and of Mr. Harry Chester, who was prevented, much to his regret, by sudden indisposition from being present on this occasion, it became his duty to return thanks for the complimentary resolution just passed, in which credit was given to the Society of Arts for the liberal encouragement they continued to give to the system of examinations. In the discharge of this duty, he must also thank the meeting for the cordial manner in which they had then, as always, received the name of Mr. Chester, who, as he had that day informed him by letter, though physically unable to attend, was present in heart. The Society of Arts, though more than one hundred years of age, was practically younger than ever, for, being always in the van of progress, it was successfully inaugurating with the vigour of youth some of the most important social and educational movements of the nineteenth century. Of these he need only mention the establishment of International Exhibitions, and of the system of examinations, which had that evening received such gratifying illustration, both of which stood out in bold relief as valuable contributions to the moral, intellectual, and material welfare of society. It was with the second of these they had that evening to do. In the course of the admirable speech with which the Bishop of London had favoured them, his lordship had not spoken quite so eulogistically of the system of Examinations as of some other educational appliances on which he had enlarged, and had to his (the speaker's) mind hazarded a doubt as to its proper position in the order of modern instruction. He did not, however, deem it necessary, especially at that late hour, to attempt a defence of the system, and it would be sufficient for his purpose to ask the meeting to contrast the bald routine of education, falsely so called, which obtained when he was a young man, with those enlarged means of mental development which were so much strengthened by the modern system of frequent examinations. Instead of simply "saying their lessons," as it used to be called, by rote like parrots, students were now required to show that they really understood what they had learnt. As regarded current history, such as copious newspapers now supplied, the youth of 50 years ago were obliged to content themselves with such dwarfed specimens of historical literature as he held in his hand—a *Times* newspaper, dated May 26th, 1809, of four pages, each containing letterpress of 12 by 18 inches, and for which the price charged was 6½d. Little real instruction could be extracted from such scanty materials. Working Men's Clubs and Reading-rooms could have had no food for existence if their reading were confined to such a mockery of newspaper literature as this. The spread of education, to which Examinations had given so great an impulse, had provided a source of instructive amusement in matured life, infinitely preferable to the ignorance and vice by which the leisure hours of too large a portion of the working classes were formerly debased. For the recognition of the important position the Society of Arts had been privileged to occupy in this movement, he begged again to thank the meeting as their representative.

A vote of thanks was proposed by the Rev. R. WHITTINGTON, and seconded by Mr. WALFORD GREATOREX, to the Honorary Examiners and Essay Adjudicators, which was replied to by Dr. WINTZER.

A vote of thanks to the professors, teachers, and lecturers, was proposed by the Rev. W. WINDLE, seconded

by Mr. MONTAGUE GORE, and replied to by Mr. F. REYNOLDS, on behalf of the professors.

Mr. P. L. SIMMONDS proposed, and Mr. E. G. CLARKE seconded, a vote of thaks to the Bishop of LONDON.

The BISHOP having replied,

The Rev. J. MASKELL proposed, and Mr. THOMAS WHITTINGTON seconded, a vote of thanks to the LORD MAYOR, which having been acknowledged, the proceedings terminated.

## Proceedings of Institutions.

BURNLEY MECHANICS' INSTITUTION.—The report for last year says that the great and prolonged calamity which has fallen upon the industry of this populous district has sensibly affected the Institution in its finances and the extent of its operations. Strong as the claims of the Institution upon the public undoubtedly are, the directors have not deemed it expedient to make any general appeal for assistance, while such large local effort has been required and put forth to meet the urgent necessities of the operatives in their deep distress. Nor could the directors calculate upon the usual benefit from the annual festival. The aim of the directors has been to maintain the efficiency of the leading departments of the Institution, and to exercise the most vigilant economy over all, trusting to the return of prosperous times for the removal of any debt which might be incurred. The expediency of a more restricted supply of newspapers and periodicals to the reading-room has been repeatedly under discussion, but these discussions have tended to show the necessity of a more liberal rather than a more limited supply. The reading-room has, during these times of scant employment, been much frequented, by many no doubt for information and improvement, and by not a few, it may be surmised, to while away time or to dispel gloomy reflections. With this large attendance of readers to provide for, no material reduction in the expenditure of this department could well be effected. A similar remark will apply to the evening classes; the distinction which the Institution has acquired in this most useful and important branch of its operations the directors have been anxious to preserve. A competent staff of teachers has therefore been retained, whose skill and assiduity are evinced by the general improvement of the members. The honour of the Institution has been well sustained in the usual examinations. The success of its members in these laudable contests has been quite as marked in this as in former years. Several have had prizes and honours awarded by the Society of Arts; several have received prizes and certificates from the Department of Science and Art; and in the East Lancashire examination, two-fifths of the entire amount appropriated by the council for prizes were gained by candidates from the Burnley Mechanics' Institution. It is due to the Art-master, Mr. Hale, and to the organising master, Mr. Clement, to state, that the drawing-class in charge of the former has made very commendable progress, and has received during the year an increase of members. The chemistry-class established by the latter has had a considerable accession of members, while the general application and progress of the class is highly commendable. Both these classes have gained high distinction in the recent examinations. The library register shows a remarkable increase in the circulation of books during the year, the number of volumes issued being 8,442; unbound publications, 703; volumes circulated by the book club, 240; total circulation, 9,385; total during the previous year, 7,197; increase, 2,188, or nearly two-sevenths. With respect to the Exchange very little alteration can be reported. The directors have given their best attention to all representations from its members, and have been induced to make some addition to the various publications supplied to the room. The list of subscribers for the year 1862 includes 192 residents, and 89 non-residents, making a total of 281; in 1861, the list included 164 residents, and 119 non-residents, total, 283; decrease since 1861, 2 only. The number of names entered in the class registers for the quarter commencing October 1st is 215; comprising, males, 154; females, 61. In the corresponding quarter of the year previous the number was 345, comprising 218 males and 127 females, showing a decrease of 64 males and 66 females, and a total decrease of 130 members. The number of members of the Institution not connected with the Exchange was, on the last quarter of 1862, 364; in the year 1861, 502; decrease, 138. The annual balance-sheet shows a deficiency of receipts amounting to £30 14s. 7½d., which being added to that of last year, augments the debt to £31 11s. 2½d. Application having been made by the Relief Committee and the Board of Guardians for the use of certain parts of the Institution, the directors felt it their duty to accede as far as possible to the wishes of both. This has been attended with considerable inconvenience to the members of the Institution and the Exchange; it has certainly been submitted to with much forbearance. Arrangements will, however, be made to mitigate the inconvenience as far as possible. In concluding their report, the directors express their admiration of the exemplary conduct of the operatives in their great distress. The sustained patience under prolonged and trying privations; the calm fortitude with which numbers have seen the savings of years exhausted; the profound tranquillity of this great population under a crisis so unexampled, present a study to the statesman and the philanthropist of the deepest interest. To what can this fortitude, this love of order, this respect for the law be ascribed? Are they not signs of general intelligence? And may not this again be regarded, in a great measure, as the result of improved and extended educational agencies, amongst which Mechanics' and Literary Institutes hold no mean rank?

FARNHAM YOUNG MEN'S ASSOCIATION.—The third triennial report speaks of nine years of continuously increasing prosperity. The Committee feel that the library is one of the most important agents for good in the constitution of the Society, and it has been their constant endeavour to place upon its shelves only such books as are of an unexceptionable moral tendency, as well as instructive and amusing. The cost of many expensive works of reference, which were purchased during the year 1861, caused a deficiency in the balance-sheet of that year, and in consequence not quite so many books as usual have been purchased during the present year. The cost of binding has now become a heavy demand upon the limited sum available for the purchase of books, and the Committee earnestly press upon the members the importance of taking care of the books whilst in their possession. The library now numbers 1,509 volumes, an increase of 571 volumes since the publication of the last report. The money expended on it during the three years has been £138 1s. 9d., or an annual average of £46 0s. 7d., the average of the three previous years being just under £49. The issue of books for home reading has been rapidly increasing. Between October 1st, 1858, and October 1st, 1861 (the returns being made up and reported at the commencement of each lecture session), no fewer than 10,578 volumes were issued to the members, and 2,626 monthly parts of periodicals. The average number of members during the three years was 280, of whom only about one-half avail themselves of the library. The museum of natural history, geology, numismatics, and objects of general interest, has entirely outgrown the space available for it in the present reading-room. The Committee hope that more space may become available on some future day, and they beg to offer their best thanks to all those who have contributed objects of interest to the collection, and to Mr. R. O. Clark, the Curator, under whose sole management it is, for the time and trouble he must have devoted to it. The expenses of the museum are not

charged upon the general funds of the Association, but are paid by the Curator with money specially collected by him for that purpose. About thirteen lectures have been given each session, besides entertainments given by the elocution section. The receipts and expenditure of the last three sessions have been as follows :—

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7th Session.—Receipts... | £25 | 5 | 3 | Expenditure... | £19 | 14 | 1 |
| 8th Session. ,, | 20 | 6 | 9 | ,, | 26 | 19 | 10 |
| 9th Session. ,, | 24 | 6 | 6 | ,, | 22 | 2 | 7 |
| | £69 | 18 | 6 | | £68 | 16 | 6 |

The issue of tickets, at 3d. each, for the admission of the labouring classes to the lectures, continues to increase. Before the commencement of the session 1861–62, the lecture-room was thoroughly cleaned, painted, &c., at a cost of nearly £9, one moiety of which was paid by the Choral Society. The state of the funds has varied during the last three years, owing to several causes, and especially that in 1861 no donations were received at all equal to those received in 1859 and 1860. The balance-sheets from 1859 to 1861 give the following totals, the accounts being made up to the end of December in each year :—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1859 Receipts ...... | £103 | 1 | 4 | Expenditure ...... | £ 96 | 11 | 0 |
| 1860 ,, | 141 | 16 | 1 | ,, | 134 | 14 | 9 |
| 1861 ,, | 125 | 15 | 7 | ,, | 131 | 19 | 4 |

## MEETINGS FOR THE ENSUING WEEK.

MON. ...Royal Geographical, 8½. 1. Baron Charles von der Decken, "On the Snowy Mountains of Eastern Equatorial Africa, with map." 2. Last letter of the late Mr. Richard Thornton to Sir Roderick Murchison, from Shapunga, on the Zambesi. 3. The Nile Expedition—Latest intelligence of Dr. Baike. 4. Letters of the late Dr. Vogel from the interior of Africa.
Medical, 8½. Mr. Wm. Adams, "On the Treatment of Disease of the Spine and Angular Curvature."

TUES. ...Civil Engineers, 8. Mr. William Parkes, "Description of Lighthouses lately erected in the Red Sea."
Syro-Egyptian, 7½. The Rev. B. Harris Cowper, "On the old forms of Worship at Ascalon."
Ethnological, 8.

## PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October 30th*, 1863.]

*Dated 23rd June*, 1863.

1576. A. R. Stocker, Wolverhampton—Imp. in preparing and fashioning iron applicable to the manufacture of boot heels, tips, and horse shoes, and in part of the machinery or apparatus to be employed therein.

*Dated 28th July*, 1863.

1871. A. Hector, Montrose—Imp. in means or apparatus for facilitating the catching of fish.

*Dated 2nd September*, 1863.

2165. M. Pinner, 12, South-terrace, Grosvenor-park, Camberwell—The manufacture of a flexible translucent material or fabric to be used as a partial substitute for glass. (A com.)

*Dated 8th September*, 1863.

2207. J. Burch, Cragg Works, near Macclesfield—Imp. in printing on certain and other terry and velvet pile carpets, felted cloths, and other fabrics and materials, and in the processes and apparatus connected therewith.

*Dated 19th September*, 1863.

2308. J. Fraser, 12, South-terrace, Grosvenor-park, Camberwell—An improved method of constructing magazines for the safer and more economical storing of volatile oils in localities where the ground and labour are expensive. (A com.)

*Dated 24th September*, 1863.

2360. H. A. Bonneville, 38, Porchester-terrace, Bayswater—Imp. in horse collars. (A com.)
2361. H. A. Bonneville, 38, Porchester-terrace, Bayswater—Imp. in joining leather. (A com.)

*Dated 26th September*, 1863.

2375. E. B. Wilson, 5, Parliament-street, Westminster—Imp. in furnaces and fire-places, applicable to the heating of steam boilers and other purposes.

*Dated 30th September*, 1863.

2396. E. S. Attree, 37, Gibson-street, Waterloo-road, Lambeth—An improved cigar holder. (A com.)

*Dated 1st October*, 1863.

2400. W. Smith, 4, South-street, Finsbury—An improved process for re-crystallising sugar.
2402. T. Bell, Wishaw, Lanark, N.B.—A new mode of manufacturing bricks and tiles.
2403. H. A. Bonneville, 38, Porchester-terrace, Bayswater—Imp. in railway and other breaks. (A com.)
2404. L. N. Le Gras, Rathbone-place, Oxford-street—Imp. in cooking stoves and apparatus.
2406. J. Bell, Linton, Cambridgeshire—Imp. in couplings for railway carriages.
2408. G. Dickey, Southwark—Imp. in winkers or eye-screening apparatus for horses and other animals.
2410. T. Horsley, 10, Coney-street, York—Imp. in breech-loading fire-arms.

*Dated 2nd October*, 1863.

2412. J. Farrar, Halifax—Imp. in machinery or apparatus for spinning and doubling wool, alpaca, mohair, cotton, silk, flax, and other fibrous substances.
2416. J. G. Tongue, 34, Southampton-buildings, Holborn—An improved compound reactive agent and universal mordant to be employed in the processes of dyeing and printing. (A com.)
2418. J. J. Lundy, Leith, and R. Irvine, Musselburgh—Imp. in the manufacture of paper.
2420. G. T. Bousfield, Loughborough-park, Brixton—Imp. in revolver fire-arms. (A com.)
2422. J. Bowron, South Stockton, Yorkshire, and G. Robinson, Welbeck-street, Cavendish square—Imp. in the manufacture of soda.

*Dated 3rd October*, 1863.

2424. G. R. Tilling, Birkenhead, and J. Park, Liverpool—An improved mode or method of filling tobacco pipes of an improved construction.
2426. T. Fagg and J. Fagg, Panton-street—Imp. in the manufacture of boots and shoes.

*Dated 5th October*, 1863.

2430. C. Brakell, W. Hoehl, and W. Gunther, Oldham—Imp. in motive engines worked by water, steam, or other motive-power. (Partly a com.)
2432. C. Tomlinson, Grove-vale Cottage, Great Barr, Staffordshire—Imp. in taps, cocks, hydrants or valves, and apparatus connected therewith, for opening, closing, regulating and facilitating and otherwise controlling the passage or flow of water, air, steam, gas, and other fluids and liquids.
2434. W. H. Bailey, Keighley, Yorkshire—Imp. in machinery for combing wool and other fibrous materials. (Partly a com.)
2438. J. Towlson, Heigham, Norwich—Imp. in apparatus for cooling liquids.
2440. W. Legg, Liverpool—Imp. applicable to sewing machines.

*Dated 6th October*, 1863.

2442. E. Whitehouse, Wolverhampton—Certain imp. in the manufacture of wrought iron shackles.
2446. G. Dyer, Regent-street—Imp. in the construction of railway carriages.

*Dated 7th October*, 1863.

2450. E. Leak, Longton—Improved apparatus to be used in placing "glost" china and earthenware in ovens and kilns for firing, burning, or baking such ware.
2452. G. F. Graham, Upper Gordon-street, Euston-square—Imp. in high pressure cocks.
2454. C. P. Button, 27, Leadenhall-street—Imp. in pumps. (A com.)
2456. R. Zox, Nelson-square, Blackfriars-road—Imp. in the manufacture of academic caps.
2458. E. Slaughter, Bristol—Imp. in locomotive engines.
2460. G. Whight, Ipswich—Imp. in washing apparatus. (A com.)

*Dated 8th October*, 1863.

2462. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in propelling ships and in the apparatus employed therein. (A com.)
2464. C. Crosswell, 8, Salisbury-street, Strand—Imp. in breech-loading fire-arms. (A com.)
2465. M. Smith, Bushfield House, Donnybrook-road, Dublin—Imp. in washing, cleansing, salting and packing butter, and in apparatus to be employed therein.
2466. G. Canouil and F. A. Blanchon, Paris—Shooting toy fusees, toy rockets, or other similar toy missiles, by means of toy pistols or other toy fire arms.
2468. J. D. Dougall, 59, St. James's-street, Westminster—Imp. in "camel guns" and other light artillery, which imp. are also applicable to "punt guns" or other heavy fowling pieces or rifles.
2472. A. V. Newton, 66, Chancery-lane—Imp. in the construction of condensers. (A com.)

*Dated 9th October*, 1863.

2474. J. Wood, J. Whitehead, and T. Tetlow, Oldham—Certain imp. in machinery or apparatus for governing the speed of steam engines.
2475. J. Elsom, 10 and 11, Regent's-row, Dalston—Imp. in parallel turning, and in machinery for that purpose.
2476. E. W. James, Brynllys, Cardigan—Improved apparatus and arrangements for giving buoyancy to or raising sinking or submerged ships and other sinking or sunken bodies.
2478. J. McInnes, Liverpool—Imp. in sheathing for navigable vessels of iron or wood, which sheathing is also applicable to the covering of roofs, walls, and other purposes.
2481. N. Fellows, 123, Chancery-lane—An improved mode of extinguishing fires in chimneys and flues, regulating and promoting draught therein, calculated also to act as a ventilator.

*Dated 10th October*, 1863.

2484. G. W. Reynolds, Smethwick, Staffordshire—An improved manufacture of bands or strips for crinolines.

2488. W. B. Fairbanks, J. Lavender, and F. Lavender, Walsall, Staffordshire—Imp. in the manufacture of hames.

*Dated 12th October*, 1863.

2492. A. Inglis, 53, Arthur-road, Holloway—Imp. in taps or cocks, part of which imp. is applicable to the lubrication and protection of the journals of revolving shafts, axles, or spindles.
2494. W. Hutchison, 21, Cardigan-street—Imp. in the manufacture of fittings for powder flasks.
2498. T. Browning, Liverpool—Imp. applicable to metallic casks and the machinery for the manufacture of the same.
2500. T. Fox, Ballingdon (near Sudbury), Essex—Improved apparatus for cleaning out the tubes of steam boilers, which apparatus is also applicable for cleaning out other tubes.

*Dated 13th October*, 1863.

2506. J. Dodge, Manchester—Imp. in machinery for rolling, shaping, or forging metals, and in apparatus for grinding and polishing the same.
2508. J. E. Poynter, Glasgow—Imp. in throwing projectiles by means of explosive agents, and in apparatus therefor.
2509. J. Place, Hoddlesden, Lancashire—Improved application of certain schistous or shaly materials to the manufacture and finishing of paper.
2510. A. Rolfe, Amwell-street, Pentonville—Imp. in means or apparatus for propelling carriages on railways, tramways, or on common roads.
2512. T. Scott, 31, Nelson-square, Blackfriars-road, Southwark—Imp. in floating docks.

*Dated 14th October*, 1863.

2516. J. Inchley, Birmingham—Imp. in valves for double cylinder steam engines.
2518. M. F. D. Cavalerie, 10, Rue de la Fidélité, Paris—Certain imp. in obtaining centrifugal motive power.
2520. W. J. Rideout, Bolton, Lancashire—Imp. in boiling rags and other paper making materials.

*Dated 15th October*, 1863.

2525. P. Lesley, Morley's Hotel, Strand—Imp. in the manufacture of rails for railways. (A com.)
2527. S. R. Smith, 7, Delamere-street, Paddington—Imp. in apparatus for connecting chain cables, and for clearing a ship's hawse when foul, and also in apparatus for acting on and preventing strain to the chain cables when ships are riding at anchor.
2529. B. F. Weatherdon, Kingston-on-Thames, Surrey—A new apparatus for rubbing off or removing the dust or dirt from boots and shoes.

*Dated 16th October*, 1863.

2531. J. Polglase, Bodmin, and J. Cox, Manchester—Improved apparatus for boring and cleaving stone.
2533. R. A. Brooman, 166, Fleet-street—Imp. in pumps to be worked by steam. (A com.)
2534. F. A. E. Guironnet de Massas, Hoxton—Imp. in smut machines, and in machines for cleansing and peeling grain and seeds.
2536. S. Jay, Regent-street—Imp. in the manufacture of stockings and drawers.

*Dated 17th October*, 1863.

2537. M. Meisel, Park-walk, Brompton—Imp. in apparatus for ascertaining the weight of the load supported by the springs of railway locomotives and carriages for the purpose of regulating and equalising such load. (A com.)
2539. J. Shanks, Barrhead and Greenock, N.B.—Imp. relating to water-closet and other valves or taps.
2540. W. Hampson, jun., Dukinfield—Certain imp. in looms for weaving.
2541. W. Routledge and F. F. Ommaney, Salford—Certain imp. in "baling boxes" used in packing cotton or other fibrous materials.
2542. W. Clark, 53, Chancery-lane—Imp. in rotary engines. (A com.)
2544. W. Clark, 53, Chancery-lane—Imp. in sewing and embroidering machines. (A com.)
2545. L. R. Chesbrough, Brooklyn, U.S.—An improved let-off motion for looms. (A com.)
2547. W. Darlow, North Woolwich-road, and R. H. Lawson, Victoria-terrace, Victoria-docks, Essex—Imp. in apparatus or means for obtaining motive power.
2548. J. Wright, Rochester—Imp. in machinery for cutting railway sleepers to receive railway chairs.
2550. F. De Wyldé, Trinity-square, Tower-hill—Imp. in the induration of stone, cement, stucco, brick, or other analogous materials, also in the manufacture of artificial stone.
2551. F. De Wyldé, Trinity-square, Tower-hill—Imp. in the separation of molasses and other impurities from sugar crystals. (A com.)

*Dated 19th October*, 1863.

2552. J. Champion, Manchester—Imp. in machinery or apparatus for preparing, spinning, and doubling cotton, flax, wool, and other fibrous materials.
2558. W. Clark, 53, Chancery-lane—Imp. in separating ores from their gangues, and in apparatus for the same. (A com.)

*Dated 20th October*, 1863.

2559. J. Taylor, J. Lees and J. Lees, Oldham—Imp. in machinery or apparatus for opening, cleaning, and mixing cotton or other fibrous materials.
2560. E. H. Luebbers, Liverpool—An improved treatment of textile substances to obtain a species of, or substitute for, cotton. (A com.)
2561. W. Ingham, Manchester, and I. Wood, Pendleton, near Manchester—Imp. in the manufacture of copper rollers used for printing calico and other materials.
2563. D. Mills, Birmingham—An imp. or imps. in the manufacture of moulds for casting studs for chains.
2564. J. Vaughan, Birmingham—Imp. in the manufacture of pecks, hoes, adzes, and other edge tools, and in tools to be used in the said manufacture.
2565. J. Michaelis, Tower Royal, Cannon-street West—Imp. in the manufacture of purses, pocket-books, and wallets, and in the construction of double action locks for the same and other similar purposes.
2569. J. Bryant, Edgware-road—Imp. in vent apparatns for facilitating the drawing off or letting off fluids.
2570. H. B. Barlow, Manchester—Imp. in shoes, boots, and other coverings for the feet. (A com.)
2571. W. A. Dixon, Glasgow—Imp. in making aluminate of soda and other aluminous salts.
2572. G. Davies, 1, Serle-street, Lincoln's-inn—Imp. in forming stitches over the edges of fabrics, and in machinery connected therewith. (A com.)
2573. J. W. Nottingham, Clayton-place, Kennington-road—Imp. in "Hansom cabs," parts of which imp. are also applicable to other wheeled carriages.
2574. G. H. Daglish and T. Windus, Saint Helens, Lancashire—Imp. in machinery for bending plates for iron ships and other like purposes.
2575. C. Garton, Bristol, and T. Hill, Southampton—Imp. in evaporating, cooling, and melting, and in apparatus employed therein.
2577. T. Restell, Water-lane, Tower-street—An improved construction of walking-stick umbrella.

*Dated 21st October*, 1863.

2578. W. Hartcliffe, Salford, Lancashire—Certain imp. in mules for spinning and doubling.
2580. J. Hinton, Btrmingham—An imp. or imps. in breech-loading fire-arms.
2582. N. F. Taylor, 5, Manby-street, Stratford—Imp. in increasing the illuminating power of coal gas, and in the means and apparatus employed therein.
2583. G. Howell, Hawarden Iron Works, near Holywell, Flintshire—Imp. in apparatus for condensing metallic and other fumes.
2588. Z. Colburn, 3, Upper Bedford-place, Russell-square—Imp. in steam engines.
2590. J. Dodd, Oldham—Imp. in mules for spinning and doubling.
2591. W. E. Newton, 66, Chancery-lane—An imp. in sewing machines. (A com.)

## PATENTS SEALED.

[*From Gazette, November 3rd*, 1863.]

*2nd November.*

1053. F. Bennett.
1110. J. Fortune.
1112. B. G. Sloper.
1116. W. Walsh.
1122. P. Bradshaw.
1124. W. Glover.
1127. T. Sagar and J. Wilkinson.
1130. S. Hibbert, J. Lawton, and J. Kay.
1131. S. D. MacKellen.
1132. I. M. Singer.
1135. A. Sturrock.
1138. J. Park.
1143. G. Bower and A. Dick.
1145. J. Bettridge.
1146. C. A. Day, A. Lamb, and T. Summers.
1149. P. J. Livsey.
1151. Henry Schooling.
1153. C. L. Braithwaite and J. Hirst.
1154. J. H. Bailey.
1157. E. Chamonin-Boet.
1158. C. F. Bielefeld.
1160. W. Thomson.
1161. J. Strickland.
1164. J. Norie.
1173. C. H. G. Williams.
1179. C. Shorrock and W. Shorrock.
1187. B. Lilly.
1201. T. Parkinson and F. Taylor.
1206. B. Lambert.
1230. J. Hinks.
1231. R. Talbot.
1234. J. T. Newton.
1267. J. T. Markall.
1296. S. E. Rosser and J. G. Jennings.
1338. George Gore.
1487. I. G. Bass and W. Bass.
1579. S. Robinson, J. Priestley, and J. Foulds.
1724. W. Clarke.
1753. L. M. Bournique and J. B. Vidard.
1754. L. M. Bournique and J. B. Vidard.
2108. T. Westhorp.
2320. W. Elsdon.

## PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, November 3rd*, 1863.]

*26th October.*

2668. D. Joy.
2674. W. E. Newton.
2701. W. Edwards.

*28th October.*

2640. T. Neal.
2656. J. H. Johnson.

*29th October.*

2652. J. Beck.
2685. G. Hamilton.
2771. H. E. West.
3067. J. R. Cooper.

*30th October.*

2718. T. W. Rammell.

*31st October.*

2690. W. E. Newton.
2717. W. Hewitt.

## PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, November 3rd*, 1863.]

*29th October.*

2539. T. S. Salt.
2547. J. T. Way.
2741. S. Fox.

*30th October.*

2577. J. Nasmyth and R. Wilson